

There are a number of reasons fertigation may just make sense for your course.

by John Torsiello

Implementing fertigation practices with the use of an irrigation system is becoming quite prevalent among turf professionals.

There are several reasons, the most significant being that the procedure allows superintendents to get bio-stimulants and nutrients to a wide area of the course without time-consuming and labor-intensive methods of traditional dispersal, such as machine or hand application.

“Using irrigation systems to fertigate certainly has become more popular, especially with some of the new guys who feel it is almost like having another assistant superintendent who can make applications where and when most needed,” says Gary Bauman, a partner in the Shelter Island, N.Y., golf industry supply and consulting firm, Island Bio Greens. “You can make applications, albeit sometimes not very precise applications, at

your discretion to areas of the course where a machine sprayer would have difficulty getting to, such as bunker banks and green surrounds.”

Fertigation is the combination of mixing fertilizer and irrigation water and then distributing it through an irrigation system. Typically, small amounts of fertilizer are injected into the irrigation water supply and then distributed.

Brian Vinchesi, owner of Irrigation Inc. in Pepperell, Mass., says using irrigation systems to fertigate just makes sense.

“Having fertigation capabilities allows the superintendent to better time their applications. They do not have to water in a broadcast fertilizer or put down more than necessary to last longer as they have to avoid play. With fertigation, the turf can be spoon fed nutrients. Many superintendents also apply, or only apply, wetting agents through their fertigation systems.”

Rich Silverman of Rain Rich, located in, quite appropriately, Greenlawn, N.Y., chimes in, “(Fertigation) is great for golf courses because turf is always being cut short and the soil compacted from golfers and equipment, so it always needs to be watered. By mixing in small amounts of fertilizer and other turf and soil-enhancing products the turf can better resist problems that plague it.”

Fertigation results in very little waste of fertilizer and studies have shown small amounts of fertilizer distributed slowly and uniformly on a consistent basis

produces healthier plants that are more resistant to disease, Silverman says.

Compatibility of today’s irrigation systems with fertigation procedures are really unlimited, Vinchesi says. “Depending on the amount of money spent the systems can be very versatile, and the more sophisticated systems interact directly with pump stations and central control systems,” he says. “Pretty much anything that is labeled for injection can be applied through an irrigation system. Injection of more than just fertilizer is commonplace. With the proper amount of storage tanks and mixing tanks, odd mixtures and teas can be applied.”

Depending on the fertigation system manufacturer, units can be as basic as a quick coupler system with little or no control, or as sophisticated as any computer-driven control system, giving the user a very precise tool to apply fertilizers calculated in parts per million, says Erik Christiansen, president of EC Design Group, an irrigation consulting firm headquartered in West Des Moines, Iowa.

Brad Sparta, superintendent at Ballyowen Golf Club at the Crystal Springs Golf Resort in Sussex, N.J., is a big advocate of fertilization by irrigation.

“At Ballyowen, our fertigation is on constantly,” he says. “We have our micrometers set very low, so whenever we are watering we are fertigating. It is constantly feeding your turf and you never get that ‘flush’ of growth or that bright neon green flash.”

“It is constantly feeding your turf and you never get that ‘flush’ of growth or that bright neon green flash.” – Brad Sparta, Ballyowen Golf Club

When Ridgewood Country Club in Ridgewood, N.J., site of this year’s PGA Tour Fed Ed Cup playoff series The Barclay’s tournament, installed a new irrigation system in 2005 the club added a fertigation system “because it would have been foolish not to when the opportunity presented itself,” says Todd Raisch, CGCS.

“Initially, I refused to entertain the idea of putting nitrogen through the system,” he says. “I was concerned about rates, stuck heads, calibration, leaks, etc. We started out with wetting agents that first year and added phosphate the next year. In the last couple of years we have added nitrogen. At first, it was in the rough only and we were using larger quantities of nitrogen every three to four weeks just to supplement our granular program. As we became more comfortable with the system we eventually added the fairways.

He normally sprayed .35 lb/N/M every month on his fairways, Raisch says, and somewhere between that third and fourth week things would go a bit off color. “An extra tenth supplied through the system was just the right amount to carry us through to the next spray,” he says. “The second half of this past season I went with ultra low rates across the board, .01 lb/N/M, every time we watered. We used ammonium sulfate and have been thrilled with the results. The consistency in color and growth improved almost immediately everywhere on the course.”

The results, Raisch says, speak for themselves. “We held the Barclays and using the fertigation system in the outer roughs has done wonders to help it recover from foot traffic.”

Dustin Riley, CGCS, Oconomowoc Golf Club in Oconomowoc, Wis., injects penetrating-type wetting agents into his course’s irrigation system starting mid-May through

August. He prefers penetrating-type wetting agents because he is more concerned with having the ability to wet the profile and simulate a soaking rainfall than retaining water within the upper four inches of the root zone.

“My irrigation is ground water fed and is very high in manganese,” he says. “During stretches of low rainfall, repeated irrigation cycles continually dump manganese into the soil. As concentrations build the soils tend to seal up and restrict water movement. When the soils reach this state, irrigation becomes less effective and the turf becomes stressed. In the past, I was only able to wet two to three inches of the profile with a 30-minute irrigation cycle (about 0.25”). By injecting a penetrating wetting agent along with my normal irrigation cycle I am able to wet 12 to

18 inches of the soil profile with 50 percent less water.”

Riley’s fertigation processes result in considerable savings.

“I spend approximately \$3,000 a year on injected wetting agents. This is a tremendous savings if compared to a 90-day type of wetting agent,” he says. “By injecting the wetting agent through the irrigation I do lose the ability to specifically target a confined area, such as a tee surface or fairway turf, like I would with a dedicated sprayer application. On the flip side, injecting the wetting agents directly into the irrigation system allows some product to reach the perimeters of the playing surfaces, such as green surrounds or immediate roughs covered by irrigation.”

Mike Swing, CGCS, Visalia Country Club in Visalia, Calif., plans to include fertigation capability in the course’s new irrigation system scheduled to be installed within the next two to three years.

“At my past three golf courses I had fertigation installed and found it to be very beneficial in our fertilizer program,” he says. “The first two were grow-ins. In this situation – new



Fertigation distributes small amounts of fertilizer and other turf and soil-enhancing products enabling it to better resist problems.

irrigation, good spacing and excellent coverage – it really helped address our poor soil conditions (high calcium bi-carbonate) and push our Bermuda grass fairways to quicker maturity. Because we were in a grow-in situation time was of the essence to meet a grand opening that was in step with the housing market. This is where fertigation really pays off in faster maturity and early mowing to develop that playability density. In conjunction with traditional granular fertilizers we were able to inject sulfuric acid to offset our high pH water and calcium bi-carbonate soils. We also used wetting agents to help the germination and soil percolation issues.”

For a new course grow-in, Swing believes fertigation is an essential tool in addressing many issues that face a golf course superintendent and the high expectations of the owner and soon-to-come golfers.

Moving past grow-in, he says, fertigation can spoon feed a course to avoid growth surges commonly associated with granular fertilizer.

“Of course, you can use granular fertilizer in small rates and repeat several times,” he

says. “But then that’s where fertigation excels. You can be fertilizing at night when you and your crew are sleeping, a huge labor savings, and have controlled growth. In many parts of the country, golf courses are over seeded. Again, fertigation is a great tool to get your rye grass up and going for that all important first cut.”

When it comes to purchasing equipment for fertigation, Swing advises superintendents to do their homework.

“Choose only high quality injectors,” he says. “Liquid fertilizers are very corrosive and you really don’t want to have issues. Control packages that produce variable injections to match your pump station output are also critical. Double wall tanks may not be necessary in your state but you’ll sleep better with a double wall tank. That also goes for high quality fittings. Also, spend time traveling to a golf course that is known to have a good system and management program.”

Superintendents should first understand that fertigation systems are tools and as such can perform some tasks very well and others not as well, Christiansen says. “The superintendent should analyze the maintenance program to determine the potential uses for injection technology in their concept of course management,” he says. “Some of the best uses of nutrient injection are color and growth management, particularly with materials that require frequent application at low rates; micro-nutrients for example. Water quality adjustments also fit well with injection.”

The true benefit of fertigation is better sustained growth rates, addressing soil conditions in a very deliberate and consistent manner and the labor saved in applications that now can be scheduled for other course improvements, Swing says. “Fertigation will only perform to the level of your irrigation system,” he says. “Poor coverage and station control will not live up to your expectations or monies spent.”

Injecting wetting agents through his irrigation system has improved irrigation efficiency and playing conditions, Riley says, adding he highly recommend this option for wetting agent application.

While proven effective, using irrigation systems for fertigation may not be for everyone. Mark Mansur, superintendent at Wintonbury Hills Golf Course in Bloomfield, Conn., has considered using his irrigation system for fertigation, but he found it to be

cost prohibitive for his small budget. A more targeted approach with a sprayer or spreader is in line for Wintonbury for more controlled nutrient management. “I’m sure it is a valuable tool for some golf courses,” he says. “It probably depends on the layout and other topographical issues.”

Many superintendents do not have fertigation and those that do utilize it in varying amounts, Vinchesi says. Some use it judiciously, while others use it for simpler applications, such as wetting agents or have abandoned them over time. Many times, non-use is due to a superintendent change. “Fertigation systems require a level of knowledge and maintenance that is different than just using a sprayer,” he says. “For one, it is not at the maintenance facility it is at the pump station, which makes it less convenient. It also requires liquid products or dissolving other products.”

To fertigate through an irrigation system, superintendents need a versatile, quality system, which is not cheap, Vinchesi says. “Inexpensive systems many times require that you apply large amounts of water to get down the desired application because the fertigation pump is too small,” he says. “As a result, the golf course is over-watered to apply the fertilizer. There are drift concerns also. A golf course that is completely surrounded by residential homes may not be good for fertigation application. Some products are hazardous and require special handling, especially with acid inject systems.”

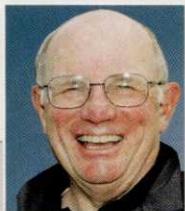
For superintendents new to the concept of fertigation fear can be an overriding factor, Christiansen says.

“If they would start by trying a product that has low cost, low risk and high reward they would develop a trust,” he says. “Magnesium sulphate is one such product. It used to be applied as often as iron for its greening ability but has gone out of favor. Many of the best injection products are more ‘old school,’ while the industry is pushing constantly to newer, more cutting edge technologies. What gets lost is the fact that the modern computer driven fertilizer injector is a very modern and sophisticated product.”

While it may not be a panacea for best practices turf management, irrigation-based fertigation nonetheless can be a valuable tool in any superintendent’s arsenal. **GCI**

John Torsiello is a freelance writer based in Torrington, Conn.





Monro Miller is a retired golf course superintendent. He spent 36 years as superintendent at Blackhawk Country Club in Madison, Wis. Miller can be reached at groots@charter.net.

POP QUIZ

How good are you at golf course history?

So, in that spirit of academia I offer the GCI golf course history pop quiz.

The fall semester is well underway all across the country and many students have already experienced a few surprise quizzes. They are usually offered as a way to measure what students are actually learning rather than a measure of ability to take exams.

So, in that spirit of academia I offer the GCI golf course history pop quiz. We'll leave it to our great turf college programs to gauge contemporary and technical knowledge. No reference books allowed. Give yourself 10 points for each correct answer; 70 points are required to pass.

- 1 The GCSAA will soon announce the winner(s) of the 2011 Col. John Morley Distinguished Service Award. One past recipient of the DSA received this award three times. Name that person.
- 2 Who/what graced the cover of the July/August 2010 issue of the USGA Green Section Record?
- 3 How long has golf been in America?
- 4 In the history of golf courses in America, what has been the predominant golf turf?
- 5 The role of women has steadily risen over more recent years – as superintendents and assistants, as sales reps and corporate officials, and as faculty researchers and instructors. Who was likely the first woman to make major contributions to the science of turfgrass management?
- 6 A lot of turfgrass research was conducted at the Arlington (VA) Turf Gardens of the USDA, from the earliest days until the WWII period. At that time, the turf research was moved to a USDA facility at Beltsville, MD. What was built on the site of the Arlington Turf Gardens?
- 7 Charles Piper and Russell Oakley earned a prominent and important place in our history of golf turf. How?
- 8 Why should the name Edwin Budding ring a bell for you?
- 9 What company sold the first commercially available triplex greensmower? When was that?
- 10 T or F. The USGA Green Section "Specifications for Putting Green Construction" celebrated its 50-year anniversary this year.

If you passed, congratulations! If not, study hard; maybe you will have better luck next quiz.

Answers
 1. O.J. Noer, agronomist for the Metropolitan Milwaukee Sewerage District (MMSD) and developer of the turf market for Millorganite.
 2. There isn't a print copy of the USGA Green Section Record anymore. The last print issue was May/June 2010 and the cover featured Green Section Award Winner Dan Potter.
 3. Since Feb. 22, 1888. On that date, six men gathered at a hillside cow pasture in Yonkers, N.Y. and tied up a gutta-percha golf ball. Six clubs were used, all handmade by Old Tom Morris.
 4. Every quiz should have at least one gimme question – for this quiz it is this easy question. The easy answer? *Poa annua*.
 5. Dr. Fanny Fern Davis. She supervised experiments that led to the development of 2,4-D and the modern era of weed control on turf. She was the director of the USGA Green Section during WWII.
 6. The DOD's Pentagon Office Building.
 7. By writing the first comprehensive and thorough textbook on golf course turf management, "Turf for Golf Courses," in 1917. It was revised and updated a number of times and for decades after its introduction was the principle reference of golf turf.
 8. Mr. Budding, an English engineer, worked at a carpet mill back in 1828. He watched the final trimming of a carpet with spinning blades set at a height above the carpet nap. It occurred to him the same idea would work to trim grass at the same height, resulting in the reel mower.
 9. Jacobsen, in 1868. On a brief personal note, I attended the first Jake school for turf students in June of that year. We were introduced to the prototype (they had three of them – one in Racine, WI, one out west and one down the south). I was drafted into the Army for two years, and when I came home the triplets were on most courses, both Jacobsen's and Toro's.
 10. True. The specs were introduced in 1960.

When it comes to golf courses,
turfgrass is king.

However, trees are an important component of the
golf course landscape that are sometimes ignored
or overlooked by superintendents and their crews.

Tree Care *on the* Golf Course

By A. D. Ali, Ph.D.



Several factors contribute to the reduced attention given to trees on golf courses. First, most superintendent training and education programs emphasize turf care with little or no mention of trees and woody plants. This causes the superintendents and their staff to be uncomfortable or unsure of how to properly care for their trees.

Second, players and members are usually concerned with the conditions of the course more so than those of the landscape. They usually pay more attention to the presence of weeds or diseases, color and aesthetics of the turf, and playability and speed of the greens.

Third, most courses have budgetary constraints that limit the superintendent's options for allocating funds. As a consequence of the second and third points, superintendents often opt to allocate the lion's share of their budget to turf care.

Trees provide many valuable contributions to the golfscape. They direct play on the fairway and

define doglegs. Placement of the tree determines the level of skill. Care should be taken, however, not to place the tree too closely to the line of play. Balls colliding with the trunk result in "Golfer Canker," which is represented by large, distorted, bleeding areas on the trunk. Trees also provide shade, which is important for golfers, but detrimental to turf. Taller trees can provide

“When pruning trees, correct arboricultural practices must be followed. Improper pruning may lead to poor shape and structural defects.”

a backdrop for following ball flight and they can separate fairways to mitigate liability. A large tree, or a certain type of tree, may be a course's signature.

In nature, trees and turf do not co-exist. Trees provide dense canopies that result in shading and light interception. Most turf-

grasses prefer full sun and grow weakly or not at all in shady conditions (Photo 2). Placement of trees and knowledge of their size and shape at maturity become important.

In addition, proper pruning of trees and canopy thinning or elevating are vital when attempting to minimize shade. When pruning trees, correct arboricultural practices must be

followed. Improper pruning may lead to poor shape and structural defects. As the tree grows and the defects become larger, they may create hazards such as limbs failing and striking players. Again, knowledge of the tree growth habits is essential.

Another potential consideration when



4



3

1 After being hit by a golf ball, this tree now suffers from a "Golf Canker".

2 Untrimmed trees cause shaded areas that may result in weak to no turf growth.

3 Poorly hydrated trees may develop "leaf burn", stressing the tree and diminishing its aesthetic value.

4 Flowering trees, while aesthetically pleasing, result in unacceptable litter and attract bees.

Additional Reading

Golf Course Tree Management

1999. Lilly, S. John, Wiley & Sons, New Jersey, 216 p.

Manual of Woody Landscape Plants: Their Identification, Ornamental Characteristics, Culture, Propagation and Uses

1998. Dirr, M. A. Stipes Publishing, LLC, Champaign, IL. 1187 p.

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1997. Meerow, A. W. Betrock Information Systems, Inc., Cooper City, FL, 153 p.

A Photographic Guide to the Identification of Hazard Trees in Urban Areas, 2nd Ed.

1994. Matheny, N. P. and J. R. Clark. HorScience, Inc., Pleasanton, CA 85 p.

Arboriculture: Integrated Management of Landscape Trees, Shrubs and Vines, 4th Ed.

2004. Harris, R. W., J. R. Clark and N. P. Matheny. Prentice Hall, 578 p.

Pest Management in the Landscape: An Introduction

2008. Luley, C. J. and A. D. Ali. Visual Identification Series, 89 p.

placing trees on the course is litter. Most trees are deciduous and some, such as eucalyptus, shed not only leaves, but bark sections as well. Placing them too closely to play areas may require additional cleanup. Flowering trees enhance aesthetics, but may drop their flowers and result in unacceptable litter. Bees visiting those flowers may create a nuisance to players.

Tree and turf roots will compete for water and nutrients. Some trees, such as walnuts, produce allelopathic compounds that are detrimental to adjacent vegetation. On the opposite end, dense turf roots may outcompete tree absorbing roots and result in reduced growth and tree vigor. Surface applications of granular fertilizers in turf areas do not benefit tree roots. Deep root fertilization should be considered when caring for trees in turf areas.

Tree roots may also grow close to the surface, which interferes with mowing and

reduces aesthetics as well as creating fall and trip hazards. A reasonable solution is to mulch the area under the drip zone to exclude turf. This results in a win-win situation. Root competition will be reduced, turf will continue to grow in sunny areas, and trunks will not be damaged by maintenance equipment such as mowers and string trimmers.

Irrigation is another factor to consider when caring for trees on the golf course. Water pH must be monitored, and if the pH is too high, it should be buffered. High water pH may increase soil alkalinity leading to nutritional deficiencies. This is common on courses with pine trees, which display chronic yellowing of needles known as pine chlorosis. Another aspect to consider is the soluble salts and TDS (total dissolved solids), especially when using reclaimed water for irrigation. If the salts are high, leaf burn may result, which stresses the trees and reduces their aesthetic value.

Trees provide many benefits on the golf course. Proper placement and knowledge of growth habits will minimize any challenges created by forcefully growing trees close to golf turf. Specific emphasis on trees should be placed in superintendent training programs. In addition, superintendents will likely be seeking more advice and recommendations from arborists regarding proper tree care, providing business opportunities for arborists. Given intelligent budgetary allocation, trees can contribute many tangible and intangible benefits to the golfscape over their long life span. **GCI**

Dr. A. D. Ali, Ph.D., BCMA, is technical advisor with the Davey Institute, a division of the Davey Tree Expert Co.

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BY ERIC BAUER

Challenged to improve fairway playability, The Club at Carlton Woods took a new approach toward dealing with organic matter.

In a world of high expectations, golf course superintendents are always evaluating new cultural practices that can be implemented to improve playability at their facilities.

Since 2006, five years after our grand opening, The Club at Carlton Woods challenged me to develop a plan to improve the playability of the fairways.

But first, some details about the facility. The Club at Carlton Woods is a private 36-hole facility located in The Woodlands, Texas. It's one of only two gated communities in the U.S. to offer a private Nicklaus/Fazio combination.

The Woodlands is a 28,000-acre master-planned community located 27 miles north of downtown Houston. The Nicklaus course opened with great acclaim in 2001 and the Faizo course followed in 2005, both being designated by Golf Digest third Best New Private facility in the U.S. after opening.

The Woodlands Development Co. wanted to create a special place that was maintained at the industry's highest level. The care and conditioning of the course would always be conducted in a manner that best preserves long-term playability and health of the plant while remaining true to the courses' original designs. This goal created a standard that we used not only after the courses were grassed, but implemented during the construction and grow in of the courses.

In an effort to provide the best possible playing surfaces, the design team along with consultants recommended that the fairways be sand capped with 8 inches of sand as well as install miles of sub surface drainage. This proved to be an excellent decision; however, as time passed we found that sand capping the golf courses would require a different approach with future cultural programs to achieve the desired playability by the membership.

Both courses have Tif-eagle on the greens, however the turfgrass on the fairways, approaches and tees are completely different between the two courses. At the Nicklaus course we have Tifway 419 Bermuda grass, and at the Fazio we have Zeon Zoysia grass, which made Carlton





EVOLUTION

ORGANIC

Woods the only course in the Houston area to select Zoysia grass as a playing surface. Many superintendents understand that Bermuda and Zoysia grasses produce high levels of organic matter and thatch throughout the growing season and as time passes they will require aggressive cultural practices to maintain proper organic matter levels.

In 2006, I began receiving comments from the general membership that the fairway playability at the Nicklaus course was being impacted in the following ways:

- Debris was being collected on the ball after impact on a regular basis;
- Decrease in ball roll after impact;
- Extended periods of wetness after rain fall; and
- More days with cart path only restrictions.

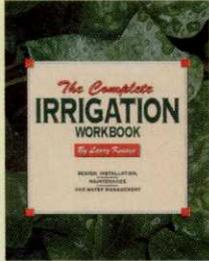
I did my best to educate the membership that there are many factors that affect surface playability starting with weather, growing season, turf density, soil structure

and excessive organic matter accumulation. After consulting our hired agronomist -- Ed Etchells, president of Greens Management / Golf Turf -- we determined our main focus would be to reduce the percent level of organic matter in the soil as well as improving the soil structure.

My objective was then to determine the best methods, establish frequencies and project costs that would control organic matter. We concluded that the best way to accomplish this was by aerification, de-thatching and sand

GET THE RESOURCES YOU NEED...

YOUR TURF WILL THANK YOU!



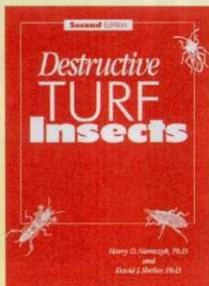
The Complete Irrigation Workbook: Design, Installation, Maintenance and Water Management



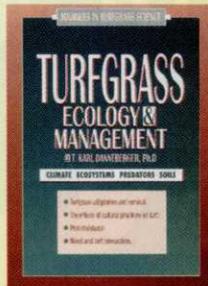
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COURSE CONDITIONS



The author found the best way to control organic matter was by aerification, de-thatching and sand topdressing.

topdressing. These cultural practices would focus on improving surface firmness, debris collected on the ball at impact, ball roll throughout the playing surface, infiltration rate of water, plant health and density.

So starting in Spring 2007 we added a second scheduled hollow-core aerification in the spring, implemented a sand topdressing program to dilute the organic matter, treated irrigation water with acid to lower water pH and bicarbonate levels, applied gypsum and lime to improve water penetration and lowered total nitrogen input per year.

These practices all displayed excellent results. In fact, our test results concluded that over a two-year period we were able to reduce our organic matter by 2 percent. However, in a period of instant results there was still a membership demand to reach our fairway standard in a shorter time frame. This request required me to develop a plan and research equipment that was available to deliver a greater impact on improving our fairway playability.

After Ed Etchells recommendation, we determined that the Koro dethatching machine could be a solution to our problems. The Koro dethatcher is an aggressive, vertical mower that has the ability to dethatch at a 2-inch depth on 1-inch spacing, as well as remove the excess material by way of a conveyer belt. University research found that vertical mowing will have the greatest impact to surface area toward organic removal. I knew that the Koro had to be added to our hollow core aerification and topdressing program. Once we had an additional method to aid in correcting our issue, a plan of action was developed and presented to the owners and membership.

The first step of the plan was to determine the percent level of organic matter that was below the turf. This was accomplished by sending off a sample core to an accredited soil testing lab, which determined the percent level of organic matter that is present throughout the first 3 inches.